COALITION COMMAND, CONTROL, COMMUNICATIONS, COMPUTER, AND INTELLIGENCE SYSTEMS INTEROPERABILITY: A NECESSITY OR WISHFUL THINKING?

A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements for the degree

MASTER OF MILITARY ART AND SCIENCE
General Studies

by

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In order to achieve coalition C4I systems interoperability, this study recommends a course of action (COA) to rely on common US C4I systems or adopt common technical standards to ensure coalition interoperability in the acquisition of C4I systems. Adopting this COA allows alliance and coalition partners to either purchase US C4I systems or design and procure C4I systems that will be interoperable based on common technical standards.

Future operations will be multinational and coalition interoperability will be paramount to success. Training programs, combined exercises, military-to-military contacts, foreign military sales, coalition doctrine, modularity, the global grid, and Radiant Mercury (a tool for multilevel security) formulate conditions for success, thus making coalition interoperability the next logical step beyond joint interoperability when designing, procuring, and build US C4I systems.

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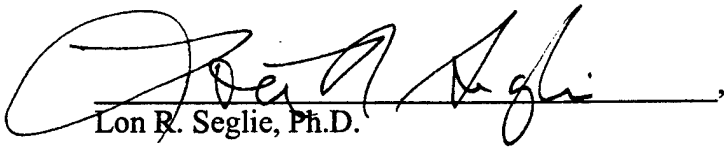

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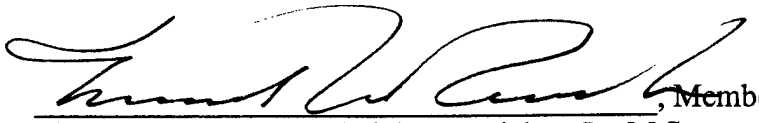

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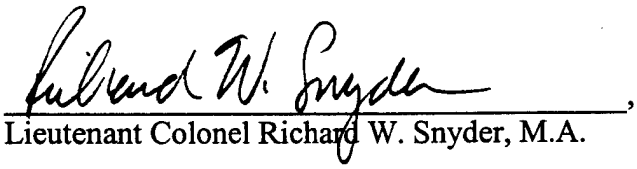

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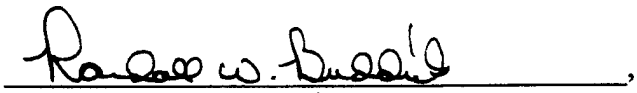

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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

COALITION COMMAND, CONTROL, COMMUNICATIONS, COMPUTER, AND INTELLIGENCE SYSTEMS INTEROPERABILITY: A NECESSITY OR WISHFUL THINKING? by Major Michael B. Black, 77 pages

This study examines whether coalition command, control, communications, computer, and intelligence (C4I) systems interoperability is the next logical step for the US beyond joint interoperability. This study uses US experiences in the Korean War, DESERT SHIELD/STORM, Operation JOINT ENDEAVOR, plus past research to analyze and establish currents trends, patterns, and gaps in coalition interoperability. It is clear from previous operations and past research that the US, allies, and coalition partners have not mastered coalition C4I systems interoperability.

In order to achieve coalition C4I systems interoperability, this study recommends a course of action (COA) to rely on common US C4I systems or adopt common technical standards to ensure coalition interoperability in the acquisition of C4I systems. Adopting this COA allows alliance and coalition partners to either purchase US C4I systems or design and procure C4I systems that will be interoperable based on common technical standards.

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ABBREVIATIONS

ACC	Air Combat Command
ACE	Allied Command Europe
AFSOUTH	Armed Forces Southern Command
ATO	Air Tasking Order
AUTODIN	Automatic Digital Network
AWACS	Airborne Warning and Control System
BC2A	Bosnia C2 Augmentation
C2	Command and Control
C2IPS	C2 Information Processing System
C3I	Command, Control, Communications, and Intelligence
C4I	Command, Control, Communications, Computers, and Intelligence
C4IFTW	Command, Control, Communications, Computers, and Intelligence for the Warfighter
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
CAOC	Combined Air Operations Center
CIA	Central Intelligence Agency
CINC	Commander in Chief
CIS	Communications and Information Systems
CJCCC	Combined Joint Communications Control Center
CJTF	Combined Joint Task Force
COP	Common Operation Picture
COTS	Commercial off the Shelf

CRONOS	Crisis Response Operations in NATO Operating Systems
DDN	Defense Data Network
DIA	Defense Intelligence Agency
DII	Defense Information Infrastructure
DISA	Defense Information Systems Agency
DISN	Defense Information System Network
DoD	Department of Defense
DSN	Defense Switched Network
E-mail	Electronic Mail
EUCOM	European Command
FMS	Foreign Military Sales
GCCS	Global Command and Control System
GOTS	Government off the shelf
IFOR	Implementation Force
INSS	Institute for National Strategic Studies
JIEO	Joint Interoperability Engineering Organization
JITC	Joint Interoperability Test Command
JWID	Joint Warfare Interoperability Demonstration
LNO	Liaison Officer
LOCE	Linked Operations Intelligence Centers Europe
MSE	Mobile Subscriber Equipment
NATO	North Atlantic Treaty Organization

NDU	National Defense University
NSA	National Security Agency
PfP	Partnership for Peace
PME	Professional Military Education
POC	Points of Contact
SACEUR	Supreme Allied Commander, Europe
SHAPE	Supreme Headquarters Allied Powers Europe
SIPRNET	SECRET Internet Protocol Router Network
STAGNAG	NATO Standardization Agreement
TADIL	Tactical Data Information Link
TRI TAC	Tri-service Tactical Communications
UN	United Nations
US	United States
USAFE	United States Air Forces Europe
USAREUR	United States Army Europe
USEUCOM	United States European Command
VTC	Video Teleconference
WAN	Wide Area Network
WWMCCS	Worldwide Military Command and Control System
WWW	World Wide Web

CHAPTER 1

INTRODUCTION

Our nation's challenge and our responsibility--is to sustain that role by harnessing the forces of global integration for the benefit of our own people and people around the world . . . the United States and its partners in the international community are laying a foundation for security and prosperity in the 21st century. (The White House 1998, iii)

The White House
A National Security Strategy For a New Century

While retaining unilateral capability, whenever possible we must seek to operate alongside alliance or coalition forces, integrating their capabilities and capitalizing on their strengths. (Shalikashvili 1997, 8)

General John Shalikashvili
National Military Strategy: Shape, Respond, Prepare Now--A Military Strategy for a New Era

It is not enough just to be joint when conducting future operations. We must find the most effective methods for integrating and improving interoperability with allies and coalition partners . . . we expect to work in concert with allied and coalition forces in nearly all of our future operations and increasingly, our procedures, programs, and planning must recognize this reality. (Shalikashvili 1996, 9)

General John Shalikashvili
Joint Vision 2010

Not even large military powers with global security interests and commitments, such as the United States are able to commit all their force to a single regional conflict, situation, either unilaterally or in a Coalition. Coalitions may be the only means to achieve a total force adequate to counter the adversary with large on-hand forces, e.g., Iraq prior to Desert Storm. (Henaidy 1997, 2)

Lieutenant General Adulaziz M. Henaidy, Royal Saudi Air Force
Mixing & Matching Capabilities in Coalition Operations

> In future, as combat capability is increasingly tied to continual real time communication of intelligence, surveillance, command and coordination information, the interoperability of these systems will become more important to achieving substantial effective tactical cooperation, especially in air and naval forces; and it will become increasingly difficult and expensive to maintain such interoperability with US forces, as the pace and level of their investment in such systems continues to grow. (Australia Department of Defence 1997, 48)
>
> Australia Department of Defence
> *Australia's Strategic Policy*

Introduction

The President of United States (US), senior civilians within the Department of Defense, senior US military officers, allied strategic policies, as well as allied and coalition military leaders each assert that future world military operations will include the US integrating with allies and coalition partners. The Honorable Jacques S. Gansler, Under Secretary of Defense (Acquisition and Technology), further asserts that the current and future geopolitical situation foster coalition operations and technology sharing. He goes on to state that this means systems, including the command, control, communications, computer, and intelligence (C4I) systems, must be interoperable (Gansler 1998). With military doctrine and prevailing senior leaders' thoughts in mind, the US and coalition partners must work together to determine whether to pay the interoperability bill now or later.

Before the future need for coalition interoperability can be analyzed both the progression of US involvement in allied and coalition operations since World War II and the history of US joint interoperability warrant examination. Just as military doctrine evolves and adapts through historical events and lessons are learned, so too will coalition

interoperability evolve through its predecessor joint interoperability. It is important to have a basic understanding of the US progression in allied and coalition operations as well as the history of US joint interoperability and joint warfare before throwing another variable(s) like coalitions or alliances C4I systems into the equations. This US progression in allied and coalition operations and the US joint interoperability experiences provide the basic foundation for this study. Additionally, both the US progression in joint operations and joint interoperability experiences could provide lessons learned and identify strengths and weaknesses associated with coalition interoperability.

This study uses US experiences in the Korean War, DESERT SHIELD and STORM, and Operation JOINT ENDEAVOR to analyze the progression of US involvement in allied and coalition operations since World War II. Each of these operations takes place in a different theater--the Pacific, the Middle East, and Europe--where different allies and coalition partners participated in operations. The Korean War involved the first major deployment of US troops since World War II and was fought under the auspices of the United Nations (Rice 1997, 160). DESERT SHIELD and STORM provide a recent example where thirty-seven nations formed an ad hoc coalition to achieve a common goal (Silkett 1993, 75). Operation JOINT ENDEAVOR provides a unique opportunity to capture experiences and lessons learned from a coalition of thirty-six nations (Wentz 1997, 3,35). Operation JOINT ENDEAVOR was NATO's first-ever ground force operations, first deployment "out of area," and first joint operation with Partnership for Peace partners and other non-NATO countries, including Russia (Wentz

1997, 35). Chapter 2 is specifically dedicated to analyzing this historical progression in coalition operations.

In order to achieve joint interoperability it may be necessary to achieve jointness first. Before joint interoperability was employed or conceived the services, JCS, and Congress were using the term "jointness" to get the services to interact better and perhaps reduce some redundancy. Although most wars and conflicts the US has been involved in included the use of force by more than one service, it was not until 1986 that Goldwater-Nichols Act mandated jointness (Rosen 1993, 37). The Goldwater Nichols Act made a number changes in the power of the Chairman, Joint Chiefs of Staff, and made a number of changes in the training (profession military education) required for joint officers. However, the part of the act that had the most profound effect on joint interoperability was the portion that effectively shifted major weapon system acquisition authority to the Office of the Secretary of Defense. This shift of authority catalyzed the foundation for joint interoperability into the design, procurement, and acquisition of defense equipment. General Colin Powell, the first Chairman to serve his entire tour under the Goldwater-Nichols Act sums by stating:

> When a team takes to the field, individual specialists come together to achieve a team win. All players try to do their very best because every other player, the team, and the hometown are counting on them to win. So it is when the Armed Forces of the United States go to war. We must win every time. Every soldier must take the battlefield believing his or her unit is the best in the world. Every pilot must take off believing there is no one better in the sky. Every sailor standing watch must believe there is no better ship at sea. Every marine must hit the beach believing that there are no better infantrymen in the world. But they all must also believe that they are part of a team, a joint team that fights together to win. This is our history, this is our tradition, this is our future. (Department of Defense 1991, 4)

Although the Goldwater-Nichols Act may have laid the foundation for joint interoperability, Operation DESERT STORM alone illustrated several examples that showed the US still had joint interoperability issues that needed to be resolved. Some of those examples include: (1) no integrated automatic distribution system capable of sending the Air Tasking Order (ATO) to all US forces and coalition forces; (2) stovepiped intelligence and command information systems which focused on national customers rather than tactical level customers; and (3) incompatible communications systems, specifically multichannel and switched systems (Reddy 1997, 13).

The challenges associated with coalition interoperability are at least proportional to the challenges associated with joint interoperability simply because coalition interoperability is attempting to solve the same issue of integrating systems designed by different manufacturers for different users. In the case of coalition interoperability there are more variables--different countries, different language, different doctrine, and different equipment. The fact that the US has not resolved all the issues associated with interoperability among its own forces indicates there is more work to be done to ensure success in coalition interoperability. This thesis will examine those issues and look at whether some of those issues can be mitigated through the US C4I acquisition process.

Assumptions

Assumptions to conduct this research thesis are divided into three major categories: (1) joint interoperability correlation with coalition interoperability, (2) alliances versus coalitions, (3) future military operations, and (4) other aspects of interoperability.

Joint Interoperability Correlation with Coalition Interoperability

This study assumes there is a correlation in the joint interoperability and coalition interoperability. Lessons learned from US attempts at joint interoperability can be applied to coalition interoperability solutions. Simply put, with respect to C4I systems, coalition interoperability and joint interoperability share the same goals of successfully integrating equipment from different sources.

Alliances versus Coalitions

This study assumes that although alliances and coalitions are very different (reference definitions starting on page eight), the challenges and issues associated with C4I interoperability within each are very similar. Consequently, the terms alliance and coalition are often used together in this thesis.

Future Military Operations

This study relies on the assumption that future military operations will involve coalition partners that require US and coalition C4I system interoperability to be successful. This study further assumes the US is technologically superior and will remain technologically superior in C4I systems; therefore, US C4I systems will form the baseline for coalition operations.

Other Aspects of Interoperability

Although there are other aspects to successful coalition interoperability like training, education, and language barriers, this study assumes C4I system compatibility and integration is the most important and most difficult to implement.

Problem Statement and Research Questions

Primary Research Question

Given the progression of US involvement in allied and coalition operations since WWII, should coalition interoperability be the next logical step beyond joint interoperability when designing, procuring, and building US C4I systems?

Secondary Research Questions

1. Is the US really prepared to move more rapidly toward international standards in order to facilitate combined interoperability? Or is the strategy to gravitate everyone to US equipment and US standards?

2. What is the framework for defining interoperability with so many potential coalition partners?

3. What is the proper balance between the need and desire for interoperability with allies and potential coalition partners on one hand and the need to protect national security-related information and technology on the other?

Definitions

Several key terms must be defined for the purposes of this study. Joint Pub 1-02, 1999, and Chairman of the Joint Chiefs of Staff Instruction 6212.01A, 1995, are used to defined the following terms used throughout this study.

Alliance. An alliance is the result of formal agreements (i.e., treaties) between two or more nations for broad, long-term objectives, which further the common interests of the members.

Coalition. A coalition is an ad hoc arrangement between two or more nations for common action. A coalition force is composed of military elements of nations that have formed a temporary alliance for some specific purpose.

Command and Control. The exercise of authority and direction by a properly designated commander over assigned forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission.

Command, Control, Communications, Computer, and Intelligence (C4I) System. C4I system is any system featuring all or a subset of the following: Communications automated information or intelligence systems or equipment that assist the commander in planning, directing, and controlling forces. C4I systems consist of hardware, software, personnel, facilities, and procedures and represent the integration of information (including data), information processing, and information transfer systems organized to collect, produce, store, display, and disseminate information.

Compatibility. The capability of two or more items or components of equipment or material to exist or function in the same system or environment without mutual interference.

Integration. The arrangement of systems in an architecture so that they function together in an efficient logical way.

Interoperability. Interoperability is the ability of the systems, units, or forces to provide services to and accept services from other systems, units, or forces, and to use the

services so exchanged to enable them to operate effectively together. The conditions achieved among communication-electronics systems or items of communications-electronics equipment when information or services can be exchanged directly and satisfactorily between them and or their users.

Standard. Standards as referenced in thesis will be information technology (IT) standards. IT standards include standards for information processing, information content (such as standard data definitions) information formats, and information transfer. IT standards provide technical definitions for information system processes, procedures, practices, operations, services, interfaces, connectivity, interoperability, information formats, information content, interchange, and transmission or transfer. IT standards include trade association standards (e.g., Institute of Electrical and Electronics Engineers (IEEE) standards), nongovernment national or international standards, Federal standards, military standards, and multinational treaty organization standardization agreements.

Unity of Command. Unity of command is one of the nine principles of war. All forces operate under one responsible commander who possesses requisite authority to direct forces in pursuit of a common unified purpose. Arguably the single most import principle of war.

Unity of Effort. Coordination and cooperation among all forces, not necessarily part of the same command structure toward a commonly recognized objective.

Limitations

This study is limited to the use of unclassified information. Although there is a wealth of information on C4I systems and their use at classification levels above unclassified, this study is exclusively focused on unclassified information. Many of the

C4I systems that are used by the US and coalition partners obviously process classified information and provide pertinent information to commanders and decision makers at all levels.

Constraints

Not all aspects of interoperability are technical (C4I system interoperability related) in nature. Although other aspects of interoperability play an essential role in validating C4I system interoperability, this study is primarily constrained to the technical aspects. The nontechnical aspects of coalition interoperability include doctrine, training, tactics, techniques and procedures, logistics, and language. These non-technical aspects are briefly addressed to show their relevance to the C4I system aspect of coalition interoperability. Each of the above nontechnical aspects warrants a more thorough review that is outside the scope of this study.

According to Maurer in *Coalition Command and Control,* the development of doctrine to support and enhance coalition operations is difficult. However, doctrine drives acquisition, force structure, and training, all of which impact the degree of interoperability between forces.

Training is one of the next logical steps to coalition interoperability after the design and acquisition process. Human engineering should be integrated into the design and acquisition process. Use of a C4I system should be engineered to be as intuitive as possible with the least amount of training. How coalition partners conduct combined training is an important aspect of interoperability that should be addressed with the overall interoperability issues.

Aside from having common goals logistics may be the most import ingredient for coalition success (Silkett 1993, 80). Just as there are technical challenges associated with coalition interoperability there are logistics support challenges that users must overcome. This study will limit in scope the issues associated with logistics support like ammunition stockage, class of supply, field hospital support, host nation contract support, distribution, and local repair system.

In any coalition, communications is vital (Silkett 1993, 81). Even a fifty-year-old alliance like NATO, which uses only two official languages--French and English, has endless communications challenges (Silkett 1993, 81).

The historical analysis of the progression of US involvement in allied and coalition operations since World War II is limited to three major operations: the Korean War, DESERT STORM, and Operation JOINT ENDEAVOR. These three major operations set the tone for the US progression in coalition operations and coalition interoperability. Several operations like the Vietnam War or the most recent NATO Operation in Kosovo, ALLIED FORCE, could have been examined as tone setters as well, but this thesis only uses one operation per theater (Pacific, Europe, and Southwest Asia) to illustrate the examples of interoperability progression.

Why do this Study?

According to Maurer, from *Coalition Command and Control*, coalition efforts are increasingly viewed as the course of action of choice when dealing with global crises or issues. The most recent major conflicts that the US has been involved in provide confirmation to this thought. In other words, the US will not enter conflicts alone. At a minimum one of the US's strongest allies, the United Kingdom (UK), will likely be side

by side. In the cases of the Korean War, DESERT SHIELD and STORM, Operation JOINT ENDEAVOR, and the most recent NATO operations in Kosovo, Operation ALLIED FORCE, a coalition of the willing was established with a common objective. In each of these instances coalition warfare and coalition interoperability were of foremost importance to success. History clearly shows that future military operations will continue to be coalition operations.

Command and control is vital to any military operation. Commanders use C4I systems to exercise command and control over forces. Whether it is the parallel command structure of DESERT STORM where the US-led forces of the Western nations and Saudi Arabian-led forces from the Islamic nations or the command structure of the NATO Operation ALLIED FORCE where it was a single US led structure, C4I systems were the critical piece that enabled a commander to execute a particular operation. In either instance the US was the primary leader or shared leadership responsibility. It naturally follows that if a nation is the leader and provides the lion's share of the troops, equipment, and other resources that nation would also take a leadership role in ensuring instructions are executed. The most logical way to ensure this is through some form of coalition interoperability. In the middle of an operation it may be too late to think about making C4I systems interoperable. Interoperability needs to be considered before acquisition in the development of standards. If standards do not exist, contractors take it upon themselves to develop their own proprietary standards. If coalition interoperability is considered in the acquisition process, through testing, you obtain a sense of confidence that C4I systems can talk to each other.

Finally, Dwight D. Eisenhower once said, "although we may not have wished it, destiny has laid on our country the responsibility of the free world's leadership" (Hurd 1964, 295). With that said one might further state that the rest of the world, including those in current alliance and future coalition partners, are expecting the US to take the lead in international and military operations. The US must remain aware of these thoughts and seek ways to ensure success in future operations where coalition C4I interoperability may be the logical fist step

Chapter 2 presents three historical examples of US, allied, and coalition operations since World War II. Korean War, DESERT SHIELD and STORM, and Operation JOINT ENDEAVOR are reviewed to establish the foundation for future US coalition operations and set the tone for the literature review. Chapter 3 establishes a current theoretical framework and perspective of the primary research question. The goal of chapter 3 is to integrate trends, patterns, gaps, and expert opinions of coalition interoperability into pros and cons (chapter 4) and an analysis of conditions for success (chapter 5). I consulted experts in the field of command, control, communications, and computers for their views on coalition interoperability. The primary source of information is from professional journals or publications like *Joint Forces Quarterly* and *Military Review*, various military C4I doctrinal publications, independent articles from C4I professionals, past theses, research papers, and monographs from professional military education students.

CHAPTER 2

HISTORICAL CASE STUDIES OF ALLIED AND COALITION INTEROPERABILITY

> When the kings of the surrounding area heard what had happened to Jericho, they quickly combined their armies to fight for their lives against Joshua and the Israelis. These were the kings of the nations west of the Jordan River . . . the Hittites, Amorites, Canaanites, Perizzites, Hivites, Jebusites. (*The Living Bible* 1971, 159)
>
> Joshua 9:1-2
> *The Living Bible*

> There is no cookbook approach to coalition warfare. Every coalition will be different in purpose character, composition and scope. But there are some basic commonalities that confront any coalition commander. . . . For the most part, our historic perspectives tend to analyze the leaders who led victorious coalitions, as if the secrets of success lay in personalities, more than methods. (RisCassi 1993, 21)
>
> General Robert W. RisCassi
> *Military Review*

Introduction

Coalition warfare is not a new concept in conduct of operations. Even as early as Biblical times there was evidence that nations banded together to wage war against a common enemy. Even though there are many examples of coalition warfare throughout the past 2,000 years, this chapter will examine coalition interoperability attempts in the Korean War, DESERT STORM, and Operation JOINT ENDEAVOR.

Korean War

The Korean War is a very good historical example of allied and coalition interoperability since World War II. In the Korean War the United Nations set the framework for coalition forces of twenty-two different nations to bond together for a common mission (Cooling 1983, 27). Initially, members of this coalition wanted only to

offer logistical or sustainment support in the form of food or medical supplies and air or naval transportation support. It later became evident that the United Nations would have to use ground forces to thwart the North Korean invasion of South Korea. As with any coalition or allied operation, the command and control of forces became critical. General Douglas MacArthur, who was serving as the US Far East Commander in Japan, was selected to become the United Nations (UN) combined commander on 7 July 1950 (Cooling 1983, 27). Shortly after General MacArthur assumed command, Republic of Korea President Syngman Rhee placed his country's security forces under MacArthur's direction, hence the beginning of a unity of command effort (Cooling 1983, 27). With the response to the invasion truly being a UN effort, MacArthur's task was to "integrate" other international forces into this combined force. General MacArthur recommended 1,000 ground units, comprised of mostly infantry personnel with supporting artillery, come complete with equipment and weapons using US ammunition (Cooling 1983, 27). General MacArthur's intentions were to have these international forces attached to various US regiments and division-sized units or absorbed into a service command. Additionally, General MacArthur established English as the allied language for the operation. This command and organization structure as well as the operating procedures was the first attempt at solving the coalition interoperability issues associated with the Korean War.

The first international forces to join US and ROK troops were UK forces that were already in theater in nearby Hong Kong. These forces were committed as a whole unit complete with their own administrative and service support.

The Philippines followed by committing a battalion combat team (vanguard of a Philippine expeditionary force). These forces required an additional thirteen weeks of training before they were used in combat (Cooling 1983, 28).

The experience with the Philippine integration coupled with the impending commitment of Thai, Turkish, and Greek troops forced the United Nations command to come up with alternate procedures for integrating international forces into the United Nations command. The Commanding General, 2d Logistical Command, was directed to establish a United Nations Reception Center (UNRC) in Taegu whose mission was "to clothe, equip, and provide familiarization training with United States Army weapons and equipment to United Nations troops as determined by the Reception Center Commander" (Cooling 1983, 28).

In the end the UNRC processed troops from the Philippines, Ethiopia, Columbia, Belgium, Luxembourg, France, and Holland. The British set up a parallel effort in Taegu where they integrated forces from New Zealand, Australia, Canada, and India.

The UNRC and British counterpart organizations were able to reduce some interoperability issues through training. However, the lessons (problems) of allied and coalition communications from World War II seemed to repeat themselves in the Korean War. The fundamental communications problem remained nonstandard equipment that was not compatible (Cooling 1983, 41). To counter this communications interoperability problem, the United Nations began the practice of attaching a US Signal Corps team with each non-English-speaking unit to ensure contact with US advisors, use of standard equipment, and an English-speaking liaison (Cooling 1983, 41). The obvious drawback to

these procedures was that it took signal troops out of their normal duties and responsibilities (i.e., responsibilities to their own units).

The Korean War provided many allied and coalition interoperability challenges. These challenges include tactics and doctrine, logistics, language, training, and command, control, and communications. In Korea, the US provided the preponderance of the forces and the large portion of the logistical support. In doing so the US effected its will on the interoperability and standardization problems.

Operation DESERT STORM

Operation DESERT SHIELD and DESERT STORM began with the realization that thirty-seven nations would join together to from an ad hoc coalition with a common, single goal of mobilizing forces to oust Iraqi Forces from Kuwait (Michaelis 1992, 42). Again there was no doctrine or standard operating procedure to support integrating forces from many different nations to ensure coalition interoperability. In Desert Storm there was a rapidly formed coalition of countries whose militaries had never worked together in exercises or combined training (Michaelis 1992, 42). Command and control of forces in the Persian Gulf became an issue just as it had in previous coalitions. In DESERT STORM the US again contributed the preponderance of forces, but in this conflict there was a unity of effort dilemma (Michaelis 1992, 61). A Saudi general, Joint Forces Command (JFC) Commander, controlled all Arabic forces whereas a US Army General, US Commander-in-Chief Central Command (USCINCENT), controlled the bulk of the remaining forces whether through operation control (OPCON) or tactical control (TACON). The Saudi Joint Force Commander Lieutenant General Khalid and the USCINCCENT General Norman Schwarzkopf were coequal commanders. This

command structure was known as parallel command. Even though each commander reported directly to the their respective National Command Authorities, they were equal as far military command and control and executing Operation DESERT STORM. To increase the integration between the two parallel command staffs, General Schawrzkopf established a Coalition, Coordination, and Communication Integration Center (C3IC) to act as a liaison between the two staffs. The C3IC was organized along functional lines including positions for the Navy, Air Force, air defense, ground operations, intelligence, special forces, and logistics (Maxwell 1992, 21). The C3IC was initially designed to integrate ground forces for the defensive campaign, but later evolved into a joint-combined operations plans office (Yates 1993, 47). The C3IC was purposely co-located with the USCINCENT staff and coalition's JFC to facilitate coordination. Command decisions by General Schwartkopf or General Khalid were translated into orders or other communications for transmission up and down both chains of command (Yates 1993, 48). According to Major Barry Maxwell in his 1992 monograph, "Establishing Theater Command and Control In a Coalition of Nations: Requirements for U.S. Doctrine," the C3IC was "the primary theater level translation mechanism for working through dissimilarities between the Saudi and the American militaries" (Maxwell, 1992, 42).

The US Liaison teams also deployed with the headquarters element of the JFC-north and JFC-east commands. Major Maxwell further reports that it was these liaison teams' communications capabilities that proved to be invaluable to the Saudis because the Saudi communications systems were never designed to support the size and scope of mobility warfare exhibited through Operation DESERT STORM.

With Operation DESERT STORM the C3IC more so than actual equipment interoperability proved to be the key to integrating forces from thirty-seven nations. Ultimately the operation was very successful.

Bosnia: The IFOR Experience

In Bosnia, the United Nations, through a NATO-led coalition force of 60,000 troops from twenty-six nations, attempted to mediate between warring factions (Wentz 1997, 3). The Bosnia operation, also known as Operation JOINT ENDEAVOR, provided a unique opportunity to garner experiences from NATO's first-ever ground deployment, "out of area" and its first-ever joint operations with NATO's Partnership for Peace (PfP) partners and other non-NATO countries, such as Russia (Wentz 1997, 3).

The command and control structure for Operation JOINT ENDEAVOR was politically under the NATO North Atlantic Council whereas militarily it was under NATO's Supreme Allied Commander, Europe (SACEUR), a US Army four-star General. The NATO Combined Joint Task Force (CJTF) Commander, a Navy four-star Admiral, came from NATO's Allied Forces, Southern Europe. The non-NATO forces took their command and control instructions from the same chain of command used by NATO forces (Wentz 1997, 27). Each of the non-NATO forces also had liaison officers at both the main and intermediate headquarters level. Special arrangements were made for the Russian forces. The Russian forces were operationally, directly subordinate to a Russian deputy of the SACEUR, and in theater they were under the TACON of a US-led multinational division (Wentz 1997, 29).

In Operation JOINT ENDEAVOR integrated C4ISR systems and services were the desired end state, but uneven capabilities between the different coalition nations and

the US provided 59 percent of the military communicators (Wentz 1997, 274). Wentz states that many integrations and technical interoperability problems were successfully resolved through coordination among the US personnel in those key communicator positions.

The UK provided additional military communicators, which was another factor that contributed to overcoming some of the integration and interoperability challenges. At the height of Operation JOINT ENDEAVOR the UK provide 32 percent of the military communicators (Wentz 1997, 29). The US and UK personnel controlled over 90 percent of the military communications.

Prior to initiating Operation JOINT ENDEAVOR, NATO planners perceived there would be integration and interoperability challenges to overcome. NATO decided to conduct a major interoperability exercise called INTEROP 95 to obtain a better handle on the potential system integration and interoperability issues. INTEROP 95 involved participants from eight nations whose objective was to test all anticipated interfaces necessary for OPLAN success (Wentz 1997, 288). INTEROP 95 was successful in identifying and reducing challenges prior to Operation JOINT ENDEAVOR.

In another attempt to reduce potential NATO interoperability problems EUCOM published the *EUCOM U.S/NATO/Allied Communications Systems Automated Interoperability Handbook* (Wentz 1997, 289). This handbook was laptop computer based and documented all known interoperable configurations, including wiring diagrams and technical specifications. When communicators and operators were challenged with a systems integration issue, they would simply input the configuration in the laptop, and if

the setup had been accomplished prior, the proper configuration would "pop up" in a computer window.

Although interoperability is continuing to improve, there is a still a long way to go to achieve seamless integration of NATO, national strategic and tactical, and commercially provided communications information systems and services (Wentz 1997, 353).

Summary of Historical Cases

These historical cases show a progression in coalition interoperability since World War II. Although sequential progress was made, coalition interoperability problems still exist today. These cases provide further evidence that coalition warfare is here to stay.

The command structure of coalition operations largely influences the degree of coalition interoperability required. As operations become truly coalition in nature, where countries are bringing their own equipment to the fight, it is apparent that C4I system interoperability is a must to properly command and control forces.

Chapter 3 examines the theoretical framework: current trends, patterns, and gaps in coalition interoperability.

CHAPTER 3

THEORETICAL FRAMEWORK: CURRRENT TRENDS, PATTERNS, AND GAPS IN COALTION INTEROPERABILITY

> Interoperability is the critical enabler, and it has become more and more elusive with time. (Reddy 1997, 8)
>
> Emmitt Paige, Jr.

Introduction

Most leaders in the US, both from the political side and the military side, have publicly stated that future US military operations will not only be from a joint US standpoint, but they will involve allies and coalition partners. With that said, this chapter examines some of the past research on interoperability, coalition warfare, coalition command and control, and multinational military operations. Even though there has been research on the above issues, and some of the research touches on the requirement for coalition interoperability, none of the previous research appears to have examined coalition interoperability from the planning or acquisition stage. In other words, the previous research does not thoroughly examine coalition interoperability in the design or acquisition phase of C4I systems. Moreover, prior research studies examined coalition interoperability in its entirety versus focusing specifically on C4I systems. The requirement for coalition interoperability is also addressed in several joint publications.

This theoretical framework examines the current trends, patterns, and gaps associated with coalition interoperability. The primary source is previous research studies (primarily student theses and monographs), a NATO research fellowship, articles from professional journals, joint doctrine publications, past interoperability programs, and expert opinions.

Student Theses, Monographs, and Research

As stated in chapter 1, this thesis assumes the problems, issues, and challenges associated with coalition interoperability are related to the problems, issues, and challenges of joint interoperability. Lessons learned from joint interoperability experiences can be applied to help resolve coalition interoperability problems, issues, and challenges. Major Peter C. Reddy, USAF, examined US joint interoperability problems during DESERT STORM and then examined the current state of US joint interoperability with respect to *Joint Vision 2010* in his 1997 Air Command and Staff College research work entitled "Joint Interoperability: Fog or Lens for *Joint Vision 2010*?" Major Reddy's research provides an excellent baseline on the status of joint interoperability. Again this thesis assumes a direct correlation between joint interoperability and coalition interoperability. According to Major Reddy, "interoperability among joint and combined forces is arguably the singular key element . . . interoperability problems hurt readiness and in extreme cases, cause the needless loss of lives" (Reddy 1997, 2). Major Reddy believes the Goldwater-Nichols Act set the framework for the state of joint and combined interoperability in DESERT STORM. Major Reddy further states that while the Goldwater-Nichols Act laid the foundation for joint interoperability, problems among US forces still existed during DESERT STORM and are still prevalent today. Reddy also states that interoperability problems are not limited to the technical aspects of C4I systems, but they include doctrinal perspectives and paradigms. Although interoperability covers many areas, Major Reddy writes that the area of command and control, specifically the exchange of information and orders, is the most critical. General John Wickham, former Chief of Staff of US Army, further adds that "if solid jointness does

not exist in the command, control and communication and intelligence (C3I) area, then jointness in the other areas of military capability is largely irrelevant because forces will not be able to optimize their capabilities or operate together effectively" (McKnight 1989, 112).

Major Reddy identifies two recent exercises that highlight continued interoperability challenges among joint and combined force. The first was the All Service Combat Identification Evaluation Teams (ASCIET) 1995 and 1996. The ASCIET field evaluations brought together weapons and C4I systems in a complex threat environment with the intent to capture the C4I systems interaction (Reddy 1997, 15). The ASCIET field evaluations specifically highlighted data link incompatibilities, problems between Army mobile subscriber equipment and the Tri-service Tactical Communications (TRI-TAC) family of switches, and severe limitations in the quantity and interoperability of tactical satellite (TACSAT) communications to fuse forces or a coastal area (Reddy 1997, 15).

The second example was the Combined Joint Task Force Exercise Purple Star 1996. Purple Star 1996 was a large joint and combined exercise involving 53,000 US and UK forces along the US southeastern littoral and inland (Reddy 1997, 17). According to Major Reddy, coalition and joint interoperability problems from Desert Storm were repeated. Specifically he identifies the lack of sufficient, interoperable radios, lack of secure identification of friendly or foe (IFF) capability on UK aircraft, and the inability of the theater communications architecture to support the distribution of the air tasking order (ATO) as repeated problem areas (Reddy 1997, 17).

Major Reddy concludes that many of the newer systems tested in these two exercises will be the fielded systems by 2010, and unless the US continues with an aggressive joint and combined forced training program, the US may just be planting the seeds for future interoperability problems (Reddy 1997, 18).

Major Thomas J. Hains, USAF, discusses the coalition interoperability gap in his Naval War College research paper entitled "The Widening Gap of Interoperability between US and Coalition/Allied Communications Systems: A Challenge for the Operational Commander." Major Hains states that "as long the US continues to develop and implement new, sophisticated communications systems and spend as much money on them as it does, this problem continues to grow and the gap between US and coalition/allied communications systems becomes more of a challenge for the operational commander" (Hains 1997, 1). He offers five possible courses of action (COAs) for the US to consider to narrow this gap. These five COAs are: (1) the US could go alone and no longer participate in military operations as part of an alliance or coalition; (2) the US could provide alliance and coalition partners with the necessary communication equipment to keep pace; (3) the US could provide alliance and coalition partners with screened information from US communications systems; (4) the US could attempt to standardize (one size fits all) all future acquisitions so that new allied and coalition communications systems are immediately interoperable and compatible with US communications systems; and (5) the US could centralize planning with all allied and coalition partners but only use allied and coalition forces in the low tech solutions (Hains 1997, 11-15). Only one of these COAs, COA 4, specifically addresses the primary question in this thesis. Each of theses COAs identifies advantages and disadvantages but

none truly solve the coalition interoperability issue from the design and acquisition stages. Most of the COAs only identify temporary solutions or workarounds that would only apply in a particular situation or instance.

Major Dean S. Mills, USAF, evaluates the issues facing US and Australia in their efforts to recognize and successfully resolve interoperability challenges in his research paper entitled "Coalition Interoperability: An International Adventure." Major Mills conducts a very thorough study of coalition interoperability from a strategic point of view by examining past interoperability imperatives, current trends, future pitfalls, and finally proposes solutions.

Major Mills identifies the past interoperability imperatives as: (1) the 1947 American, British, and Canadian (ABC) Armies' Plan to Effect Standardization; (2) the Cold War in which NATO established interoperability as a major goal to be pursued; (3) the Australia, New Zealand, and United States (ANZUS) Treaty which produced an interoperable military forces effect; and, (4) the Persian Gulf War. In 1948 the air forces of the respective ABC Member countries adopted the ABC Armies' Plan and in 1949 organized their own committee called the Air Standardization Coordinating Committee (ASCC) (Mills 1999, 2). Both the ABC Army Plan and the ASCC expanded to include Australia and New Zealand in 1964 and 1965, respectively (Mills 1999, 2). In the case of the Cold War, NATO pursued standardization in the areas of doctrine, procedures (tactics), and equipment (logistics and battlefield) (Mills 1999, 2). In the case of the ANZUS Treaty, in 1957 the Australians Prime Minister directed that Australia would try to standardize armament and techniques with the US as much as practical (Australia Department of Defense 1995, 1-1). In the case of Persian Gulf War, which is sighted

several other times throughout this thesis, it was a very difficult task to integrate and synchronize forces from thirty-eight different nations.

Major Mills identifies several existing forums within the Unites States and Australia alliance that can and do focus on interoperability. These interoperability forums include:

1. NATO, which produces Standardizations Agreement (STANAGs) and Allied Publications (APs)

2. ABC and ASCC, functionally aligned to deal with land and air power respectively

3. Combined Communications Electronics Board, primarily C4I based

4. Australia, Canada, New Zealand, United Kingdom, and United States (AUSCANNZUKUS) naval Command, Control and Communications Organisation-naval C3

5. Technical Cooperation Program-R&D

6. Quadripartite Combined and Joint Warfare Conference-doctrinal and training interoperability (Mills 1999, 2).

Major Mills adds that interoperability forums dedicate a large number of personnel and focus an incredible amount of attention to solve these interoperability challenges. According to General Klaus, head of the Office of NATO Standardization, the results are varied. There are more success stories in the operations and procedures arena and less success stories in the equipment and material arena (Mills 1999, 1). Klaus adds that part of the reason for the limited success was the fact that previous attempts to solve interoperability within NATO were bottom up versus driven from the top down. Without

strategic guidance from the top, groups worked independent of each other, and there was little, if any, coordination between groups. NATO solved this particular aspect by establishing the new Standardization Organization in 1995 (Mills 1999, 2). Major Mills further adds that other interoperability groups drew the same conclusions--lack of strategic guidance limited coordination with other interoperability forums, thus causing little or no prioritization and poor use of resources.

Major Mills identifies near-universal downsizing as a potential negative impact to coalition interoperability. Major Mills presents three possible methods of dealing with the downsizing dilemma: (1) reducing some or all of the nation's alliance responsibilities; (2) conversely, increase reliance on other members of the alliance; and (3) increase the use of high technology--more lethal and precise weapons systems (Mills 1999, 5). *Joint Vision 2010* implies the US will tackle the downsizing problem via the second and third methods:

> We must find the most effective methods for integrating and improving interoperability with allied and coalition partners. Although our Armed Forces will maintain decisive unilateral strength, we expect to work in concert with allied and coalition forces in nearly all of our future operations . . . this era will be one of accelerating technological change. Critical advance will have enormous impact on all military forces. Successful adaptation of new and improved technologies may prove great increase in specific capabilities. (Shalikashvili 1996, 9)

Australia will tackle the problem in the same manner. Australian Minister of Defence Ian McLachlan states "A continued strong alliance relationship with the United States is an essential part of . . . future Asia Pacific stability and prosperity" (McLchlan, 1996). Additionally, Australia wants to maintain a technical advantage at the same level as the US (Australian Department of Defence 1994, 26-27).

Both Major Barry A. Maxwell, USA, and Major John P. Medve, USA, examine additional historical cases involving the US and coalitions in their monographs for the School of Advanced Military Studies, United States Army Command and General Staff College. In 1992, Major Maxwell authored "Establishing Theater Command and Control in a Coalition of Nations: Requirements for US Doctrine." Major Maxwell specifically examines US and coalitions in World War II, the Korean War, and Desert Storm. Major Maxwell not only looks at the command and control structure during these wars, but he also analyzes current US doctrine. General Jacob Devers, senior commander during World War II, identified several problem areas in his 1947 article for *Military Review* entitled "Major Problems Confronting a Theater Commander in Combined Operations." Major Maxwell uses three of General Devers' problem areas as a baseline for his coalition command and control analysis. The three problems areas are: (1) conflicting political, cultural, and military problems and objectives of coalition partners; (2) differing logistical capabilities; and (3) differing armaments, training, and doctrine of each armed force (Maxwell 1992, 4). Major Maxwell concludes that there is very little published guidance on combined operations and recommends a developing a joint publication for combined operations (Maxwell 1992, 41). Although Major Maxwell looked specifically at the command and control aspects of coalition warfare, it is very applicable to this thesis since most command and control aspects are driven by C4I system capability. Major Maxwell also identifies other variables that should be considered when conducting coalition warfare, such as cultural difference, logistics capability, and unity of command versus unity of effort.

Major Medve authored "Integration, Interoperability and Coalition Warfare in the New World Order." Major Medve examined additional historical case studies using four planning considerations as a baseline for his analysis. The four planning considerations are: (1) goals and objectives, (2) cultural difference, (3) equipment, and (4) military doctrine and training (Medve 1993, 3). These four planning condierations are very similar to the three problem areas Major Maxwell used as a basis for his monograph. Major Medve states the first two planning considerations foster integration while the latter two foster interoperability. Major Medve uses Tennessee and the Confederate States of America, the US and Great Britain at Anzio, and the US and UN forces during the Korean War as the historical case studies (Medve 1993, 4). Major Medve reveals that the differences in equipment are most keenly felt in the communications arena. Specifically with the US and Great Britain, the IV US Corps had to supply the British division with communications equipment in order to communicate with each other (Medve 1993, 30). Similarly, in the Korean War, the US provided the communications links between UN forces and their higher headquarters (Medve 1993, 30). Major Medve states differences in equipment between coalition partners will always exist and these differences will continually strain the flexibility of military leaders. Major Medev concludes that US coalition warfare is addressed through joint doctrine and Army doctrine at the corps and echelons above corps level. He states commanders below these levels are required to have expertise in coalition warfare, thus coalition doctrine must be expanded.

NATO Research Fellowship

Michael Codner, from the Royal United Services Institute for Defence Studies, Whitehall, London, UK, published a research fellowship on multinational interoperability

in June 1999 entitled "Hanging Together: Interoperability Within the Alliance and With Coalition Partners in an Era of Technological Innovation." The purpose of Codner's research fellowship was to provide a conceptual framework for a discussion of interoperability in a military context and then to provide examples of how to enhance interoperability. The significance of this research fellowship is that it is initiated and conducted by a country other than the US. Although Codner focuses on interoperability from a NATO and Partnership for Peace perspective, it is clearly applicable to ad hoc coalitions.

Codner begins by using the NATO definition of interoperability: "The ability of systems, units or forces to provide services to and accept services from other systems, units or forces and to use these services so exchanged to enable them to operate effectively together" (Codner 1999, 3). This definition is word for word the same as the definition from US joint publications. In order to discuss interoperability in the context of technological innovation, Codner first addresses the interoperability challenges during the Cold War. Codner believes that interoperability during the Cold War was no less important than today. He argues that during the Cold War the challenges were clearer and more specific in that the threat to NATO was immediate. There was such a perceived unfavorable balance that there was a priority on achieving military interoperability and efficiency. Codner concludes that during the Cold War the requirement for integrating forces generally took place at the higher levels of command.

Codner next addresses the present concerns of NATO interoperability. He states that in recent years there are several reasons for an increased concerned over interoperability within the Alliance: mission and force planning; national joint initiatives,

NATO enlargement, partnership, and ad hoc coalitions; technological innovation; and defence capabilities initiatives (Codner 1999, 8-10).

In mission and force planning the lack of a single, dominant threat to NATO has caused the divergence of national and strategic operational concepts among members (Codner 1999, 8). Codner believes the lack of a single strategic focus has forced incoherent national force planning and equipment programs. The Cold War concepts of "forward defence" and "flexible response" were a lot more effective in this area. The end of the Cold War has also brought about a much greater diversity in potential coalition operations. The range is from humanitarian, through peace support or peacekeeping in which combat may or may not be significant, through a major regional war (Codner 1999, 8). With this range there is not a simple, cookie-cutter model that ensures interoperability.

In national joint initiatives, individual nations have been focused on integrating and ensuring interoperability among their own forces. Just as in the US, the impetus for this has been greater efficiency as well as declining defense budgets (Codner 1999, 9). Codner believes there are mixed blessings associated with national joint initiatives. On the one hand a country may be better poised to form the "framework nation" for a coalition force. And on the other hand, this can divert attention and funding from multinational interoperability programs. Additionally, Codner believes that focusing on a national capability could lead to an emphasis on national autonomy, thus further complicating multinational interoperability. Finally, Codner states that interoperability among same services forces of different nations is sometimes better than interoperability among different services of an individual nation. He sites specific examples in the past

where NATO naval forces achieved a higher degree of interoperability among themselves than they shared with their own ground forces (Codner 1999, 21).

The expansion of NATO and inclusion of PfP countries has increased the scale of interoperability challenges (Codner 1999, 9). Simply put, there are more combinations to contend with. Newer members have interoperability desires and goals that NATO must be cognizant of and incorporate with existing interoperability programs. There is an associated financial cost for the Alliance, existing members, as well as new partners, in achieving these desires and goals (Codner 1999, 9).

Codner next addresses the different rate of technological innovation. He specifically states, "There is a wide disparity as to the rates and levels to which NATO members are able or willing to incorporate advanced technology into their military doctrine" (Codner 1999, 10). Codner contends this problem is most acute in the information technology field where rapidly increasing computer-processing power offers the potential for military application. Codner further contends this rapid, increased computer processing power is on the US end of acquisition, and the challenge is for the Allies to keep pace. He uses *Joint Vision 2010* as the document to back this claim. Codner believes *Joint Vision 2010* is a challenge for Allies to keep pace with technological advances or be excluded from full participation in future operations where technology use will play the leading role. Codner highlights one other area of concern with the technological innovation: no amount of technical connectivity or interoperability will weld units from different nations together if they are intent on employing their forces in different manners. It is for that reason that doctrine must run parallel with technology innovation.

The North Atlantic Council recently expressed their concern over the interoperability issue during the Defence Capabilities Initiative (DCI) launched at the NATO Summit by the NATO heads of state and government in April 1995 (Codner 1999, 11). According to Codner the objective of DCI was "to improve defence capabilities to ensure the effectiveness of future multinational operations across the full spectrum of Alliance missions in the present and foreseeable security environment with a special focus on improving interoperability among Alliance forces, and where applicable also between Alliance and Partner forces" (Codner 1999, 11). The DCI adds that future alliance military operations will extend multinational cooperation at lower levels that will make demands on the capabilities of contributing forces, especially in the field of interoperability.

Codner dedicates a significant portion of his research fellowship to discussing the impact of *Joint Vision 2010* on coalition interoperability. *Joint Vision 2010* is a conceptual template that addresses future military operations. The specifics of *Joint Vision 2010* are addressed later in this chapter. Codner's rationale for examining *Joint Vision 2010* is twofold. First, it is the only national strategic concept from any NATO nation that is in the public domain that addresses coalition interoperability in the long term (Codner 1999, 28). Second, the US plays a major role in NATO, and the US is committed to *Joint Vision 2010* (Codner 1999, 28). Codner identifies three reservations or questions of relevance for Joint Vision 2010. First, is the question of relevance to the most likely scenarios of peace support and humanitarian operations (Codner 1999, 29). Second, is the question of relevance of military force in any form to future challenges of security (Codner 1999, 29). In this instance Codner believes there is a US disposition to

use the military instrument of power rather than using nonmilitary means. Third, Codner feels there are those who claim *Joint Vision 2010* presents threats of political and industrial hegemony by the US (Codner 1999, 29).

Finally Codner derives four principles that he feels governs interoperability and the various levels of war: (1) the lower the level of war the more difficult interoperability becomes; (2) the higher the likelihood of combat during an operation and the more intense the level of fighting, the greater the requirement for a high degree of interoperability and therefore the higher the level of war and echelonment at which interoperability can be achieved; (3) in the future the distinctions between the levels of war will be blurred; and (4) evidence from practice shows that multinational interoperability is most difficult to achieve among ground forces and easiest in the widest range of circumstance among naval forces (Codner 1999, 11).

Codner draws several conclusions in his research fellowship. First, for the foreseeable future Codner believes that it will be necessary to accept different degrees of interoperability among NATO nations (Codner 1999, 41). Newer NATO members may not be able or willing to achieve the same level of integration as more "expeditionary" nations. Second, allied nations should accept that NATO should be the only warehouse for standards. In this respect Codner further concludes that the onus is on the US to conform to NATO standards and that the US should make every effort to harmonize procedural standards among the US CINCS and services (Codner 1999, 42). Lastly, Conder concludes that European nations need to strike a balance between collaboration with the US in research and development and in buying cost effective, COTS equipment (Codner 1999, 43).

Joint Publications

Several joint publications attempt to provide a doctrinal position on coalition warfare. First *Joint Vision 2010* provides the template of how the US military will channel the vitality of military members and leverage technological opportunities to achieve new levels of effectiveness in joint warfighting (Shalikasvili 1996, 1). General John Shalikasvili, former Chairman of the Joint Chiefs of Staff, opened *Joint Vision 2010* by stating: "The nature of modern warfare demands that we fight as a joint team. This was important yesterday, it is essential today, and it will be even more imperative tomorrow. *Joint Vision 2010* provides an operationally based template for the evolution of the Armed Forces for a challenging and uncertain future. It must become a benchmark for Service and Unified Command visions." *Joint Vision 2010* further sets the foundation for the necessity of this thesis. Joint Vision 2010 unequivocally states that future military operations will be joint and multinational. *Joint Vision 2010* further states that the US must be fully joint: "institutionally, organizationally, intellectually, and technically." The technical aspect of being "fully joint" is the primary challenge this thesis addresses. *Joint Vision 2010* further states that joint doctrine is required for successful military operations, but it must be flexible to serve as a guide for US forces in both joint and multinational (allied is assumed here, i.e., NATO).

Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 6212.01A is the formal joint publication that covers the compatibility, interoperability, and integration of new systems or modifications to existing DOD systems that have C4I capabilities (including weapon systems, DoD national foreign intelligence programs, tactical intelligence

programs, and related activities) acquired or developed in support of military operations. Specifically, CJCSI 6212.01A states:

> All C4I systems, and computer resources associated with weapon systems, developed for use by or in support of US forces are defined to be for use in joint operations and must be certified as "interoperable" with systems with which they have a requirement to exchange information. Interoperability requires that systems are interoperable vertically and horizontally to the degree specified by the warfighter and necessary to ensure timely, efficient, and survivable C4I functions at all force levels. (US Department of Defense 1995, F-1)

This further provides the doctrinal foundation for the primary question in this thesis. The instruction states interoperability in C4I systems is achieved through an early joint review of requirements, standards, and certification testing and configuration management. It goes on to state that standards must be applied as part of the systems development.

Interoperability Programs

The current method of coalition command and control interoperability is mostly limited to liaison officers, telephones, facsimiles, electronic mail, and the loaning of equipment. The success of interoperability programs thus far is mixed. The US has been involved in several programs since the 1980s, all of which have been combined to one current program, the Command and Control Systems Interoperability Program (C2SIP). The next few paragraphs describe the results of the various interoperability programs: Army Tactical Command and Control Information System (ATCCIS); Quadrilateral Interoperability Program (QIP); Battlefield Interoperability Program (BIP); and Multilateral Interoperability Program (MIP). There was limited information available on the QIP, BIP, and MIP, but there was evidence that each program was incorporated in the C2SIP.

ATCCIS--A Concept for Tactical Command and Control Interoperability in NATO

Dr. Lane B. Scheiber, member of the Institute for Defense Analysis and former member of the NATO Defense Research Group Long Term Scientific Study on Command and Control of Land Operations, addresses NATO's attempt to bridge the gap in coalition interoperability in his 1984 essay, "ATCCIS--A Concept for Tactical C2 Interoperability in NATO." As early as 1976 the NATO Military Committee identified the requirement for data systems to be interoperable among member nations. In 1978 the military committee commissioned ten tasks forces to develop long-range defense plans (McKnight 1991, 242). Task Force 6 developed the command, control, and communications portion. Task Force 6 recommended further analysis be done to determine future interoperability requirements. Later in 1980 the Deputy Supreme Allied Commander Europe (Germany) initiated the Army Tactical Command and Control Information System (ATCCIS) study to address Task Force 6 recommendations. ATCCIS was an extensive multinational effort that focused on systems to support command and control at the corps, division, and brigade level headquarters of a multinational force (McKnight 1991, 242).

The first phase of the study was the feasibility assessment phase. Germany, United Kingdom, and the US participated in this phase under the sponsorship of the SHAPE. The major areas examined in this phase included: command and control organizational structures; commonality of key command and control tasks; succession and change of location of command; current system operational requirements; current ADP system architectures; and costs of development and procurement (McKnight 1991, 243). Initially some nations felt their specific requirements for tactical data systems were

unique and that it was both unnecessary and impossible for a commonly developed system. Phase 1 concluded with Germany, United Kingdom, and the US agreeing that key tasks the nations planned to support with automation were more than 80 percent common across the three nations (McKnight 1991, 243). Other major conclusions of Phase 1 were: There were considerable similarities and differences by choice among each nation's automated systems; and nations could increase interoperability and possibly reduce costs by adopting a common development approach (McKnight 1991, 244).

Phase II, Development of the Operational and Technical Concepts, began in 1985 with France joining the study (McKnight 1991, 244). The objective of Phase II was to achieve maximum operational interoperability and to identify potential cost savings.

ATCCIS continued for several more years with various degrees of success. ATCCIS produced a Phase III and IV before it too was incorporated in the C2SIP.

Command and Control Systems Interoperability Program (C2SIP)

During fiscal year (FY) 1998 EUCOM sponsored a C4I Advanced Concepts Technology Demonstration (ACTD), chartered to develop the capability for US Army command and control systems to interoperate with army systems from other NATO countries (*C4I for Coalition Warfare* 1998, 1). The ACTD, which was demonstration under the C2SIP, exploited and integrated the previous initiatives of MIP, BIP, QIP, and ATCCIS. The ACTD also attempted to create a solution that would lead to a migration for the US Army to achieve NATO level 4 and 5 interoperability with allies through the battalion level. Level 4 interoperability is the ability to pass information from one system to another through the use of preformatted messages (C2ISP Briefing 1999, Slide 30). Level 5 interoperability is the ability to carry out direct database-to-database (push)

updates through the use of a data replication mechanism (C2ISP Briefing 1999, Slide 30). The C2ISP continues to expand previous programs from the laboratory to actual field demonstrations and finally build into current US Army command and control systems.

Expert Opinions

Several experts were interviewed either through direct personal contact or through electronic mail contact and offered their opinions on coalition interoperability. These experts were General (Retired) Carl Vuono, former US Army Chief of Staff and current Chief Executive Officer of Military Professional Resources, Incorporated. (MPRI); Brigadier General John Meincke, Director of Command and Control, Communications and Computer Systems, United States Central Command, MacDill Air Force Base, Florida; and Brigadier General Dale Meyerrose, Director, Communications and Information, Headquarters Air Combat Command, Langley Air Force Base, Virginia.

General Vuono is very much qualified to provide expert opinion on coalition interoperability through his thirty plus years of military experience, including commanding at the highest level and several joint and combined positions. Additionally, as chief executive officer of Military Professional Resources, Incorporated, General Vuono oversees the company's military-related contracting in the U.S. and international defense markets and is currently engaged with potential US coalition partners. Thus, General Vuono is in a position to understand what potential coalition partners "bring to the fight." General Vuono states that future military operations will indeed be coalition operations and the US can ill afford to be unprepared when in comes to C4I interoperability with alliance and coalition partners. General Vuono cautions that the cost of integration and interoperability with these partners must not be the US technological

edge. General Vuono adds that there are two key factors the US must consider in taking the next step to coalition interoperability. These factors include: alliance or coalition partner affordability of US-designed systems and alliance or coalition partner's willingness to purchase US-made equipment. General Vuono concludes that it is absolutely necessary for the US to capitalize on lessons learned from previous coalition interoperability attempts like Operation DESERT STORM where the US established communications liaisons with coalition partners to ensure interoperability.

General Meincke is a career air force communicator with thirty years of various communications assignments including an assignment with the Military Communications-Electronic Board and an assignment as the Vice Director of the Defense Information Systems Agency (DISA). In his capacity as the Vice Director of DISA, General Meincke oversaw the planning, engineering, developing, testing acquiring, and implementation of DoD C4I systems under all conditions of peace and war.

General Meincke states that logical steps beyond joint interoperability when designing, procuring, and building US C4I systems is absolutely coalition interoperability. According to General Meincke, this is really new ground that has only begun to be explored. He argues that currently there is not a real advocate for coalition interoperability during the procurement approval or execution process, making it that much more difficult to address coalition interoperability considerations. This is primarily because each service controls procurement funds, thus enabling each service to determine the final C4I system hardware and software design. General Meincke feels that although reviews of intended service procurements are conducted by joint agencies, such as DISA, through the Joint Interoperability Test Command (JITC), the acquisition process,

pressures of cost, and the schedule often drives service procurement officers in other directions. This brings up the issue of control, which General Meincke believes it is absolutely necessary to ensure conformance to standards. General Meincke adds that Service autonomy and control of procurement funds is at direct odds with joint and coalition interoperability. General Meincke's bottom line is "CINCs and the Chairman can only advise with respect to service POMs and budget execution. Until and unless someone is put in overall charge of how the funds are spent across the services, we will never get to where we need to be in joint and coalition interoperability" (Meincke 2000).

General Meincke also draws an interesting distinction between the real-time versus non-real-time command and control systems. He states that real-time, fire control systems and data link-type systems will most likely continue to be proprietary for security and technological edge reasons. Whereas systems, like the Global Command and Control System (GCCS), Global Command Support Systems (GCSS), and office information technology products, will continue to accelerate toward some sort of commercial standardization that will facilitate interoperability. His view is reinforced by the fact that GCCS is transitioning from a UNIX based, somewhat proprietary system, to a Windows NT, Bill Gates and commercial dominated, platform. General Meincke concludes his distinction on real time versus nonreal by stating: "If the information processing world progresses to the point where near-real time solutions are possible, and can be secured to the degree necessary, perhaps they too can evolve to commercial standards . . . but this is a long way off in time" (Meincke 2000). The US is making swift progress in the area of commercial international standards for C4I systems, and this will definitely facilitate the progress towards joint and coalition interoperability.

General Meyerrose is a also a career air force communications officer who is currently the functional leader for 15,000 communications and information professionals providing services to over 100,000 active-duty and civilian personnel at over thirty installations in the US, Iceland, and Portugal. Additionally, General Meyerrose has served as Director, Communications and Information, Headquarters US Air Forces in Europe, Ramstein Air Base, Germany, where some of his responsibilities included increasing C4I interoperability among NATO countries.

General Meyerrose identifies three specific challenges with respect to achieving coalition interoperability today: (1) knowing the difference between "bleeding edge" and "leading edge"--do not invest in technology when the "change curve" is steeper than the pocketbook can afford; (2) recognize when information technology dictates a change in mission or supportability processes and do so rather than hunt for a "box" or ready-made solution; and (3) understand that total cost of ownership, supportability, trainability, exportability, and commercial practices are far more important than the best technical solution.

General Meyerrose also cautions against some of the pitfalls of technological interoperability. Specifically he states, "High-end technology does pose interoperability issues, but in many of these instances, attaining technical interoperability equates to degrading capability or mission accomplishment. Has the U.S. used precision-guided weapons or refrained from attacking certain targets because all coalition partners couldn't do the same? I see no reason for us to treat info technology differently" (Meyerrose 2000). This is another instance where bringing coalition or alliance members on line with "releasable" standards could impact the capabilities of specific systems.

General Meyerrose's bottom line on technology and interoperability is a greater the reliance on commercial off the shelf (COTS) reduces the technical issues associated with interoperability.

After a thorough review of student theses, monographs, the NATO Research Fellowship, articles from professional journals, joint doctrine publications, past interoperability programs, and expert opinions, it is very clear that the US has not achieved coalition interoperability. Specifically, the following conclusions are drawn from current trends patterns and gaps: (1) Major Hains' COA 4 and Michael Codner's conclusions from the NATO Research Fellowship were the best attempts to integrate interoperability in the acquisition phase but both only scratch the surface; (2) integrating coalition interoperability in the acquisition of C4I systems must be considered, but is not the end in itself, and (3) there are currently limited partnerships where the non-US player wants to capitalize on the US lead; some do not. Again the solution should be to make C4I systems compatible and interoperable when they are built versus trying to build "black boxes" to integrate different systems after they are already built. This thesis recommends a twofold COA: first, rely on common systems and second adopt common technical standards (e.g., joint technical architecture (JTA) and common operating environment (COE)) to ensure coalition interoperability is integrated in the design, procurement, and acquisition phase of C4I systems. Adopting this COA allows alliance and coalitions partners the opportunity to either purchase US C4I systems or design and procure C4I systems that will be interoperable based on common technical standards. Finally, adopting this COA offers many benefits and challenges that are examined as pros

and cons in chapter 4 of this thesis. Chapter 5 will identify the conditions necessary for this COA to be successful.

CHAPTER 4

PROS AND CONS OF RELIANCE ON COMMON US SYSTEMS AND ADOPTING COMMON TECHNICAL STANDARDS FOR THE DESIGN, PROCUREMENT, AND ACQUISITION OF C4I SYSTEMS

Introduction

As with any proposed COA there are advantages and disadvantage associated with implementation. This chapter examines the pros and cons of relying on common US systems and adopting common technical standards for C4I systems as the solution to making coalition interoperability the next logical step beyond joint interoperability when designing, procuring, and building US C4I systems. The pros for this COA are related to the following areas: configuration control; unity of effort and unity of command; information dissemination and decision making; US revenues; operational commander command and control; US access, influence and reduced forward presence; burden sharing; and protection of the US defense industrial base. The cons for this COA are related to the following areas: security, costs, technological edge, training, logistics support, and potentially fighting against US weapons systems.

Pros

Configuration Control

Configuration control is the systematic proposal, justification, evaluation, coordination, approval or disapproval of proposed changes, and the implementation of all approved changes to the configuration item (C4I system in this instance) after establishment of the configuration baseline(s). According CJCSI 6212.01A all C4I systems and standards used in operations will be placed under approved configuration management. By relying on common US C4I systems and adopting technical standards

(that are adhered to in the acquisition of C4I systems) configuration management and configuration control are virtually assured. In this COA changes, modifications, and upgrades to existing C4I systems are controlled through a single configuration manager. Allied and coalition partners are not authorized to make changes without going through a formal process where the change, modification, or upgrade is thoroughly tested and certified to ensure interoperability with the existing system. Although configuration management will not guarantee future interoperability, it certainly offers a good check and balance process that otherwise would not be in place.

Unity of Effort and Unity of Command

Two of the most important aspects to ensure successful command and control are "unity of effort" and "unity of command." As stated in chapter 1 of this thesis unity of command is arguably the single most important principle of war. Much success rides on the ability of commanders to achieve unity of command. Since C4I systems are enablers of the command and control process, it can be logically concluded that the easier it is to command and control forces the greater the chance of success in achieving unity of command. According to Captain Terry Pudas, US Navy, is his essay on coalition warfare, operational commanders can prepare themselves to achieve unity of effort by understanding the various factors that influence a coalition's ability to coordinate forces (Pudas 1994, 121). Interoperability of C4I systems strongly aids the coalition commander to coordinate these forces. Interoperable C4I systems support the planning of operations. Coordinated planning is essential to conducting operations. This planning was accomplished through the Coalition Coordination Communications Integration Center

(C3IC) in Operation DESERT STORM. Interoperable C4I systems could have reduced the size of the C3IC or even eliminate the need.

Information Dissemination and Decision Making

Dissemination of information and intelligence impacts the success of coalition operations. Interoperable C4I systems allow commanders to make better use of the finite time resource. Some experts also argue that the urgency for decision making is reduced with the ability to disseminate timely information to commanders at all levels. Admiral Jerry Tuttle, former Director of the Command, Control, and Communications Directorate, Joint Staff , offered the following comments during Operation ERNEST WILL:

> With the on-scene commander, Rear Admiral Less, the CINC, General Crist in Tampa, Florida, and the Secretary (of Defense) and the Chairman (of the JCS) all having the same picture and same databases, the requirement to communicate diminished markedly. By having red and blue forces depicted in one composite picture, the relative urgency for decisionmaking could be readily determined and priorities set more intelligently. (Roman 1997, 165)

Shared information also enhances decision making at the lower levels of command. General Crist added that since the National Command Authority (NCA) received the same information as subordinate commanders, they did not feel the need to monitor or control the operation, avoiding "echelon skip" (Roman 1997, 165).

Information dissemination also aids in synchronizing and sequencing what is required for mission execution and success. According to Army Field Manual 100-5 and Joint Publication 2-0, synchronization is the arrangement of actions and forces in order to produce the maximum effort at the decisive time and place requiring explicit coordination among the various units and activities participating in an operation. Interoperable C4I systems are crucial to this synchronization. As for sequencing, interoperable

communications systems give operational commanders the capability to coordinate and arrange events (sequence) to ensure allied and coalition forces are where they are supposed to be when they are supposed to there. According to James Harrop in a *Marine Corps Gazette* article communications, systems "aid in the ability to execute tactics using decentralized control" (Harrop 1996, 1). Interoperable communications systems make decentralized control a reality, thus making sequencing a reality.

Revenues for US

According to General Meincke, the foreign military sales (FMS) approach is one the US should pursue diligently, as it has so much potential for both fostering coalition interoperability and generating revenues for the US. He adds that these revenues could even possibly be used to build the next generation software for the systems the US sells.

Operational Commander Maintains Centralized Command and Control of Forces

According to US Army Major General Joe Rigby, "Digitization is the essential enabler that will facilitate the Army of the 21st Century's ability to win . . .and provide deciders, shooters, and supporters the information each needs to make the vital decision necessary to overwhelm and overcome their adversary and win the overall campaign" (Rigby 1996, 1). As the operational commander of forces during a contingency, especially a future contingency that will surely involve forces from different nations, a commander is definitely concerned with maintaining centralized command and control. If all forces have access to interoperable command and control systems, there is less need for liaison officers, translators, and other less effective methods to achieve interoperability. This also ensures the operational commander has centralized control of information that is released to allied and coalition members. Finally, operational

commanders at different levels will be able to exchange command and control information directly with each other versus adding delays and translations. With the direct exchange of information, there is less of a chance for mistake or misinterpretation of information.

US Access, Influence and, Reduced Forward Presence

According to Lieutenant Colonel Michael Beard, USAF, in his Air War College research report entitled "United States Foreign Military Sales Strategy: Coalition Building or Protecting the Defense Industrial Base," the US can afford to reduce her forward presence overseas because of the access and influence she achieves from selling and providing equipment to other countries. Access and influence is achieved through military-to-military contacts and US support of allied and coalition partner purchased weapon systems. If allies are already giving access and allowing US influence due to the current FMS strategy, one can expect that to continue or even increase with further sales of US technology and equipment. Influence may mean "play by US rules" or be cut off from the logistics support and technical assistance (Beard 1995, 5). Lieutenant Colonel Beard provides two excellent examples of this influence: (1) The US stopped supplying HAWK missile battery and F-14 aircraft parts when Iran took hostages in the US Embassy in 1979; and (2) In 1990 the US halted exports of F-16s to Pakistan because they refused to abide by the Nuclear Nonproliferation Treaty (Beard 1995, 5).

Burden Sharing

The concept of burden sharing is a positive advantage that increases reliance on common US systems and adoption of common technical standards. Burden sharing produces a synergistic effect across the board. An actual product of the contributions by

participating countries is a robust C2 system rather than independent, proprietary C2 systems. Liken this to the invest club strategy developed by the National Association of Investment Clubs where a group of individual investors pool their resources together to have a much greater purchasing power than a single individual. Burden sharing reduces the cost per individual country and still produces the desired effect.

Protect the US Defense Industrial Base

Integrating coalition interoperability in the design, procurement, and acquisition phase of C4I system development will help maintain skills in the US defense industrial base. Former Secretary of Defense William Perry outlined seven initiatives to maintain the US defense industrial base with significant advantages. Secretary Perry states: (1) "We will maintain our technology base." (2) "We will procure unique items even if that product is not necessary in the quantities needed by the military forces." (3) If we could convert a larger portion of our procurement to dual-use items, we could be able to sustain that portion of the defense industrial base, if we maintained a robust economy, with no special actions on the Department of Defense." (4) " In order to sustain our defense industrial base, we need to embark on a major reform of the defense acquisition system." (5) "We need to support and assist defense companies in their efforts to diversify." (6) "The Defense Department must reduce overhead in bases, depots and civilian personnel." and (7) "The government will assist US companies in exporting their products across the world" (Perry 1994, 2). In the 4 December 1994 issue of *Time Magazine*, Mark Thompson takes the preservation of the US industrial base a step further by quoting a US arms seller, "people can say it's disgusting, but foreign arms sales provide jobs, help

maintain the industrial base and in a Machiavellian world give us power and influence in international relations" (Thompson 1994, 3).

Cons

Security

Security is an extremely important issue that presents some significant challenges or disadvantages when it comes to pursuing coalition interoperability. Without getting in the classified arena, it is common knowledge that the US has stronger alliances with some countries, thus releases different levels of information to different countries. With all the potential permutations of allied and coalition partners that would be players in any COA, it would be difficult to established general rules for releasibility. The US will always retain the right to determine what information is releasable. Security is a paramount constraint. Some possible resolutions to the security issues and concerns will be addressed in the modularity and Radiant Mercury portions of the conditions for success in chapter 5. Nonetheless security must be considered a challenge until there is a solution to overcome the issue.

Costs

There is an inherent cost associated with achieving coalition interoperability. The US cannot go the route of coalition interoperability with C4I systems without the allies and coalition partners paying their "fair share." On the surface this con is related to the burden share pro mentioned earlier in this chapter. However, burden sharing and having the financial ability to pay that burden are two totally different items. The UK, one the US's strongest allies, and Jordan are two countries to look at in a burden sharing and costs for example. According to *The World Factbook 1999* the UK gross domestic

product purchasing power parity is $1.252 trillion where as Jordan's gross domestic product purchasing power parity is $15.5 billion. The UK military expenditures total approximately $36.7 billion whereas Jordan's military expenditures total approximately $608.9 million. The UK possesses a technologically advanced domestic and international telephone whereas Jordan's telephone systems consist of microwave radio relay, coaxial and fiber-optic cables (Central Intelligence Agency 1999). The point here is both of these countries were US coalition partners during Operation DESERT STORM. Can the US realistically expect anything close to equal monetary contribution by these two countries when it comes to military expenditures? The answer is no.

There is also the cost of procuring the common interoperable system. Lieutenant General Clarence McKnight, former Director of Command, Control, and Communications Systems for the Joint Staff, once said, "It may be better to build interfaces rather than purple (joint) equipment, primarily because of expense" (Maurer 1997, 117). Staying consistent with one of the assumptions of this thesis, one can assume that if these expenses apply to joint equipment, they apply to coalition equipment as well.

Surrender of Technological Edge

A reliance on common systems and the adoption of common technical standards could cause the US to surrender its technological edge. The US's superior technology played a major role in the successes of Operations DESERT STORM, JOINT ENDEAVOR, and most recently ALLIED ENDEAVOR. This sharing of technology certainly could provide allies and coalition partners with technical capabilities that the US employed to be the decisive edge in the most recent conflicts. Conflicts of today and the future rely heavily on technology, specifically C4I systems, to conduct operations. The

Honorable Jacques S. Gansler, Under Secretary of Defense (Acquisition and Technology), adds the following remarks regarding technology transfer and security:

> Today, the issue of industrial technology transfer is a top priority issue for senior DoD management. The goal is to enable us to embrace "globalization", while at the same time, protect our national security and prevent our technological advances from falling into the hands of potential adversaries. We realize that international armaments cooperation increases the potential security risks involved in the transfer of militarily significant technology. (Gansler 1998, 1)

Training and Logistics Support

Training and logistics support become issues after allied and coalition members adopt common US systems or common technical standards. Many countries, especially those associated with ad hoc arrangements, require training and logistics support to operate and sustain the new equipment. In other words simply having interoperable equipment does not mean the "user" knows how to use the equipment. Additionally, what happens when modifications or upgrades are made to existing systems? In the US it has become common practice for commands to take delivery of new systems without the training and logistic support required to sustain the systems. Commands are willing to accept training and logistics support risks because they know training and logistics support normally catch up in a couple of years. But in the case of coalition operations a couple years may be too late because the learning curve is most likely to be longer.

Fighting Against US Weapons Systems

Critics of the US foreign military sales policy argue that the US should not sell or provide her best equipment for fear that her own equipment will be turned against her as were the HAWK missiles captured by Iraq in Kuwait in 1990 (Beard 1995, 16). The consequences of fighting against US shooter type weapons systems versus C4I systems may not seem lethal on the surface. However, the second and third order effects of C4I

systems in the wrong hands could in fact be just as lethal. As stated in chapter 1 of this thesis, commanders use C4I systems to exercise command and control over forces. C4I systems in the wrong hands could ultimately impact the command and control of forces.

CHAPTER 5

CONDITIONS FOR SUCCESS

> Commitment to a group effort, that's what makes a team work, a company work, a society work, a civilization work. (Hains 1997, 16)
>
> Vince Lombardi

Introduction

As the only superpower left in the world today, the US is a world leader committed to maintaining strong allies who share common equipment, doctrine and capabilities (Beard 1995, 12). The 1994 US National Security Strategy entitled *A National Security Strategy of Engagement and Enlargement* further articulates this by stating: "Through training programs, combined exercises, military contacts, interoperability and shared defense with potential coalition partners, as well as Security Assistance programs that include foreign military sales, we can strengthen the self defense capabilities of our friends and allies" (The White House 1994, 8).

The programs quoted from the 1994 National Security Strategy as well as unity of command, coalition doctrine, modularity, the global grid, and Radiant Mercury (a tool for multilevel security), formulate the conditions for success in making coalition interoperability the next logical step beyond joint interoperability when designing, procuring, and building US C4I systems.

More Exercises like Combined Endeavor 2000 and Bright Star 2000

Exercises play a critical role in validating current concepts fostering interoperability because they test hardware, people, doctrine, training, and plans (Cushman 1985, 4-7). Exercise Combined Endeavor is a US European Command

(USEUCOM) sponsored communications exercise specifically designed to explore C4 interoperability between NATO and PfP nations. The objective of Combined Endeavor is to standardize the communications technology among participating countries. This standardization is accomplished through a series of exercises that test communications and computer compatibility. Exercise Bright Star is a US Central Command (USCENTCOM) sponsored exercise that includes combat arms, combat support, and combat service support troops. Combined Endeavor is focused on communications interoperability whereas Bright Star focuses on all the aspects of interoperability.

Combined Endeavor 2000 is the sixth in a series of USEUCOM-sponsored exercises designed to identify, test, and document communications information systems (CIS) interoperability between NATO and PfP nation's military equipment. Since 1995, the program has grown form ten participating nations to over thirty-five nations. Combined Endeavor 2000 will include over 250 planners, 650 personnel, and over 3,100 interoperability tests (Stimeare 2000). The most important product of Exercise Combined Endeavor is the *Communications-Electronics Interoperability Guide*. This guide provides "one stop" shopping for communications technicians. From this guide a technician can find out if equipment from different countries has ever been tested for interoperability. If the equipment has been tested, the technician can obtain all the technical specifications for connecting the equipment.

The Bright Star exercise began after Egypt's signing of the 1979 Camp David Peace Accord. The US armed forces began training side by side with t Egyptian armed forces in the Egyptian desert. Bright Star 96 was the first time countries other than the U.S. and Egypt participated in the exercise, adding the NATO nations of France, United

Kingdom, Germany, and United Arab Emirates from the Gulf. In Bright Star 98 these same countries participated along with Kuwait, which made the seventh participating nation. What began as a small bilateral training exercise has evolved into one of the largest exercises involving US troops anywhere in the world.

Bright Star 2000 is the eleventh in the series and is the most significant to date. Bright Star 2000 sets the baseline for larger and more ambitious coalition operations in the future. Bright Star 2000 adds the Netherlands, Italy, Greece, and Jordan. Bright Star 2000 included the armed forces of eleven nations and over 50,000 troops (USCENTCOM 2000).

Exercises like Bright Star give the US, alliance, and coalition partners the perfect opportunity to employ interoperable C4I systems in the same manner that they would be used in real world conflicts. Bringing coalition armed military forces together in exercise environments builds better understanding, friendship, and cooperation, as well as strengthens the professional military relationships between the US and all participating forces through realistic training.

Radiant Mercury

According to the Radiant Mercury program office, Radiant Mercury is a software application, developed under the Navy that automatically sanitizes and downgrades formatted classified documents based on programmable rule sets. This automation eliminates the human in the equations and reduces the processing time it normally takes to perform these formally manual functions. Unified commanders and their staffs, through coordination with joint staffers, the National Security Agency, the State Department, and other agencies, determine what information is releasable to what allied

and coalition partners and tasks the Radiant Mercury programmers to "set the rules" for the Radiant Mercury software. This makes US systems more desirable and non-US forces still receive the timeliest information.

Foreign Military Sales

The export of US military equipment to allied or coalition partners is not a revolutionary military affairs process. In fact President Franklin D. Roosevelt, in an attempt to avoid or delay US entry into World War II, wanted to sell or give US military equipment to the UK through a "Destroyers for Base Deal" in September of 1940 (Beard 1995, 7). It was basically through this and other President Roosevelt initiatives that the foreign military sales (FMS) program was born. Today FMS is legislated through the Foreign Assistance Act of 1961 and the Arms Export Control Act of 1976, both as amended (Beard 1995, 7). Both of these acts authorize the sale of military equipment to foreign governments that support the US national security interests. The FMS program is the tool required to making coalition interoperability the next logical step beyond joint interoperability when designing, procuring, and building US C4I systems.

The Clinton administration attempted to strengthen the language in the Foreign Assistance Act through The Peace, Prosperity, and Democracy Act of 1994. Sections 3301 and 3302 of the bill provided explicit language that symbolized the importance providing assistance to alliance and coalition partners:

> In order to stem incipient regional conflicts worldwide, the United States sees great value in maintaining alliances, coalitions, and other cooperative defense relationships that permit more effective collective defense efforts. The United States will provide assistance to enhance the ability of countries world wide willing to share the burden of contributing to regional alliance, coalition operations, and other collective security efforts to counter threats to and maintain international peace and security. (Draft Legislation before 103d Congress 1994)

Unfortunately, Congress did not pass the act. The Clinton administration still persevered and caused the passing of new legislative guidance with the following goals: (1) Ensure that US military force can continue to enjoy technological advantages over potential adversaries; (2) Help allies and friends deter aggression or defend themselves, while promoting interoperability with US forces when combined operations are required; (3) Promote regional stability in areas critical to US interests, while preventing the proliferation of weapons of mass destruction and their missile delivery systems; (4) Promote peaceful conflict resolution and arms control, human rights protection, democratization and other US foreign policy objectives; and (5) Enhance the ability of US defense industrial base to meet US defense requirements and maintain long-term military technological superiorly at lower costs (White House Fact Sheet 1995).

Coalition Doctrine

Just as there is an ongoing effort to write, update, and expand joint doctrine to facilitate success in joint operations so too should alliance and coalition partners work to develop a coalition doctrine. General RisCassi, former Commander, US Forces Korea, refers to doctrine as the first important point a coalition must share. It allows them to take advantage of commonalities (RisCassi 1993, 60). General RisCassi further stated that without a commonly understood coalition doctrine, it is very hard to plan or execute military operations. According to Maurer, doctrine drives acquisition, force structure, and training. Therefore a coalition doctrine is a natural condition for success. Although the development of a coalition doctrine will be difficult due to many variables, coalition commanders need guidelines for decisions on command arrangement, subordination, support, priority, coordination, and a variety of other C4I issues (Winnfield and Johnson

1991, 65). A coalition must share a common doctrine to capitalize on commonalities (RiCassi 1993, 22). The commonalities in this instance are the common US systems or the common technical standards used in the designing, building, and acquiring of C4I systems.

Modularity

Modularity in C4I systems design is a process that could assist in successful implementation of this COA. For example, through modularity the US could design C4I systems in three different variants that could be released to three, separate, distinct coalition groups. In this example countries A, B, and C are all at a high level of classified technology releasibility; countries D, E, and F are at a midlevel of releasibility; and countries G, H, and I are at a low level. Using the Radiant Mercury software, the US has the capability of programming and connecting systems for different levels of releasibility. The concept here is add a "simple" device to a major end item and the system can be made available to various allied and coalition partners. General Meincke argues that this would facilitate adding a US or one of several variants of coalition companion modules to a basic core thereby making a US version or a tailored coalition version of the C4I system.

Global Grid

General Meincke looks at the global grid as another condition for success. He states that if the US can look at all proposed new C4I systems as future components of a well defined and catalogued Global Information Grid (GIG), these new proposals can be compared to all existing GIG systems and evaluated as to whether they are duplicative, interoperable, etc. Only required capabilities should be funded after insuring no other

GIG element does or could do the intended job. Capabilities would be funded only if they were GIG interoperable.

Interoperability Testing and Certification

Interoperability testing and evaluation is required throughout the life cycle of C4I systems and interfaces (CJCS 6212.01A 1995). The process for coalition interoperability testing and certification should follow a US model for joint interoperability testing and certification. At a minimum, interoperability certification should be a part of the testing process prior to production and fielding of C4I systems. The Joint Interoperability Test Command (JITC) is the DISA test center that most Department of Defense components and industry use to conduct interoperability testing and evaluation. Perhaps with additional manning, the JITC could integrate coalition designated C4I systems in their testing process as well. Since the US has the lead in development of most C4I systems, it probably would increase the workload of JITC drastically. In fact JITC is probably conducting interoperability testing and certification today on some of the same C4I systems that will be used in the allied and coalition environment.

Military-to-Military Contacts

Information sharing promotes a wide range of contacts between our military and the military of other nations. Military-to-military contacts promote trust and confidence and increase the security of our allies, partners, and friends. PfP, defense cooperation activities, FMS, the International Military Education and Training (IMET) program are subsets of the military-to-military contacts that establish long-term professional relationships between US armed forces and the future military leadership of other countries. According to USCENTCOM, military-to-military contacts with countries that

are neither staunch friends nor confirmed foes build constructive security relationships, help to promote the appropriate role of armed forces in a democratic society, and enhance stability.

Training

Since training was mentioned as a disadvantage it must be addressed to ensure overall success. Again, training is one of the next logical steps to coalition interoperability after the design and acquisition process. Interoperability is more than the technical aspects. In the case of C4I system interoperability, training in how to operate and maintain the systems is paramount to success. General RisCassi further emphasizes that the first priority in generating coalition combat power from a conglomeration of nationally separated units is training. Training is not unprecedented in the ad hoc coalition environment and may have to occur during the actual hostilities rather than prior like exercises. General Joseph Collins, commander VII Corps during the Normandy Invasion, actually retrained Allied troops during hostilities and successfully applied new techniques throughout the remainder of the European campaign (RisCassi 1993, 33).

Through developing a coalition doctrine, exercise participation, Radiant Mercury software, an aggressive FMS program, modularity, the GIG, military-to military contacts, training, and interoperability testing and certification, the US, allied, and coalition partners are poised to ensure successful coalition interoperability. Coalition interoperability can be enhanced through each of these conditions. Now that the conditions for success are identified, the primary and secondary questions are answered in the next chapter.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS FOR FUTHER STUDY

> Interoperability must be the key if the unexpected is to be treated as an everyday occurrence. (Allard 1990, 251)
>
> C. Kenneth Allard
> *Command, Control, and the Common Defense*

Introduction

Interoperability only exists "when forces can provide or accept services from other forces" (Allard 1990, 251). According to Maurer, coalitions by their very nature deal mostly in the unexpected. Ad hoc coalitions of the willing are becoming the norm, common everyday occurrence, to conflict resolution.

The previous five chapters examined C4I systems coalition interoperability to determine whether coalition interoperability was the next logical step beyond joint interoperability when designing procuring and building US C4I systems. This thesis studied case studies from the Korean War, Operation DESERT STORM, and Operation JOINT ENDEAVOR to examine the progression of coalition interoperability since World War II. The US national security and national military strategy clearly illustrate the trend for conflict resolution is either for an alliance, an ad hoc coalition of nations, or some combination of both to pool forces together and tackle the issue. In order to ensure success in such operations, coalition interoperability of C4I systems must be addressed. The conclusions of this thesis are specifically tied to answering the primary and secondary research questions.

Primary Research Question

Given the progression of US involvement in allied and coalition operations since World War II, should coalition interoperability be the next logical step beyond joint interoperability when designing, procuring, and building US C4I systems? Absolutely! Coalition interoperability can benefit from the same steps taken to improve interoperability between US military forces. These steps include common equipment, common standards, common doctrine and tactics, and common techniques and procedures (Maurer 1996, 97). The Goldwater-Nichols Act was passed in part to address the interoperability issues among US military forces. There is not a Goldwater-Nichols Act that addresses interoperability among coalition forces.

The US's commitment to international security and peace, along with an increasing perception of world economic interdependence, suggests the US will continue to be the major player in world conflict (Maurer 1996, 4). The majority of the world expects the US to take the leadership role in most conflicts where the military instrument of power is used. In each of the case studies, the US was either asked or assumed the leadership role. Since the command and control of forces were paramount to success in each case study, it can be reasonably assumed that command and control will be paramount in future coalition operations. Today, more so than yesterday, C4I systems are critical to command and control. In fact, today services are actively pursing automation across the tactical equipment spectrum; consequently, joint and coalition forces can no longer rely on manual procedures to achieve interoperability (Allard 1990, 197). The areas of responsibility and interest are larger due to increase communications connectivity. Improved technology in C4I systems now allows commanders to

disseminate command and control decisions to intermediate levels of the battlefield much faster than previous conflicts or operations. Common equipment and common standards are the first step in making coalition interoperability the next logical step. C4I system interoperability is a necessity.

Secondary Research Question 1

Is the US really prepared to move more rapidly toward international standards in order to facilitate combined interoperability? Or is the strategy to gravitate everyone to US equipment and US standards? The US is definitely prepared to move toward international standards. More and more C4I systems technology use COTS equipment. Using COTS equipment, by default, indicates a willingness to move toward commercial standards. The JTA, the US's framework for ensuring joint interoperability in system development, specifies using commercially supported international standards whenever possible. Exercises like Combined Endeavor 2000 and Bright Star 2000 further illustrate the US desire to move rapidly towards international standards. Both exercises have grown in the number of participants since they were initiated.

Secondary Research Question 2

What is the framework for defining interoperability with so many potential coalition partners? The framework must include a modular approach where different levels of releasibility can be addressed depending on the coalition partner. Again, the level of trust among partners varies from country to country, so a modular approach enhances the ability to control releasibility.

Secondary Research Question 3

What is the proper balance between the need and desire for interoperability with allies and potential coalition partners on one hand and the need to protect national security related information and technology on the other? National security must be addressed first and foremost in coalition interoperability. In other words the need and desire for coalition interoperability must not outweigh the need and desire to protect national security. Proper measures, whether tactics, techniques, procedures, or actual hardware, must be in place to guard against unintentional release of information. The end state is a secure C4I infrastructure that ensures allied and coalition partners have access to information based strictly on a need to know.

Recommendations for Further Study

There are several areas where further research will shed additional light on coalition interoperability. The scope of this thesis precluded including these areas in the research:

1. How does the international community develop and implement a coalition doctrine that all players are willing to adopt as fundamental principles for military operations? Doctrine must adjust to meet the challenges of future military operations. The US is still wrestling with the concept of joint doctrine--where only four players are required to agree upon fundamental principles. It was not until 1987, when the Joint Staff formed the Joint Doctrine Office, that there was the necessary emphasis on joint doctrine (Maurer 1996 p. 102). The number of players associated with coalition doctrine is unknown, but certainly could be more than four. The precedence for integrating doctrine between different entities does not bode well for coalition doctrine. "It took 25 years to

bring the Air Force and Army closer together doctrinally and be more cooperative" (Joint Pub 0-2). Even after fifty years, NATO doctrine continues to evolve (Maurer 1996, 101). General RisCassi refers to doctrine as the technical language that communicates the commander's intent, battlefield missions, control measures, and command relationships (RisCassi 1993, 21). Doctrine also stretches across all three levels of war--strategic operational, and tactical. The relationship of coalition doctrine to each level of war warrants further research as well.

2. What role does an individual play in achieving coalition interoperability? Key to any discussion of coalition command and control is the human being who interacts, plans and conducts operations, and pays the price for failure (Maurer 1996, 55). "The problem of modern command and control cannot be understood in isolation from who actually does the commanding and controlling--the human institutions--the government and military (Allard 1990, 241). Included in this area is the role of liaisons in the interoperability process. The size and experience of liaison teams must be further examined to determine their role once interoperability is integrated in the acquisition process.

3. When will US combat forces be placed under command of another nation and what is the impact on coalition interoperability? What circumstances must be present for US combat troops to placed under combatant command of another nation? This entire thesis is written under the assumption that the US will take the lead in future coalition operations. As the leader, the US is in the position to call the shots and persuade participants to a US- based solution.

4. What is the impact of bilateral agreements on coalition interoperability? Bilateral agreements exist independent of coalition operations. This could produce serious challenges to coalition interoperability because the two countries involved in the bilateral agreement may not have common allies.

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